



# Update on Stanford Effort on TAsD Simulations

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NO $\nu$ A Collaboration Meeting

January 30, 2005

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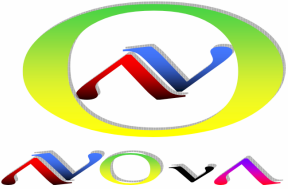
# Topics to be Discussed

- Overview of the Analysis Procedure
- Previous Results
- New Geometry
- First Results from Computations
- Light Levels for Different Cell Geometries
- Conclusions



# General Analysis Procedure

- 1st step - GEANT (by Leon Mualem)
- 2nd step - RECO MINOS
  - Track finding and fitting
  - Particle identification using loose criteria
  - Rejection of obvious non- $\nu_e$  oscillated events
- 3rd step - ntuple analysis - imposition of cuts
  - Total measured energy within  $\pm 25\%$  of nominal
  - No significant energy deposition near boundaries
  - Electron in each view
  - No gap(s) in track near vertex; track starts near vertex
  - No  $\mu$  or  $\gamma$  in event
- 4th step - maximum likelihood analysis of events passing the cuts above



# Variables used in maximum likelihood analysis

- Total measured energy
- Fraction of total energy contained in electron
- Mean pulse height near the origin of the electron
- Pulse height/plane for electron
- No of hits/plane for electron
- Energy upstream of vertex
- Curvature of electron
- Missing transverse momentum
- Fraction of total electron pulse height in its first half
- Rms deviation of hits on electron wrt fitted curve
- No of tracks identified as hadrons in event

# Results of previous analysis (spring 2004)



## Number of events processed

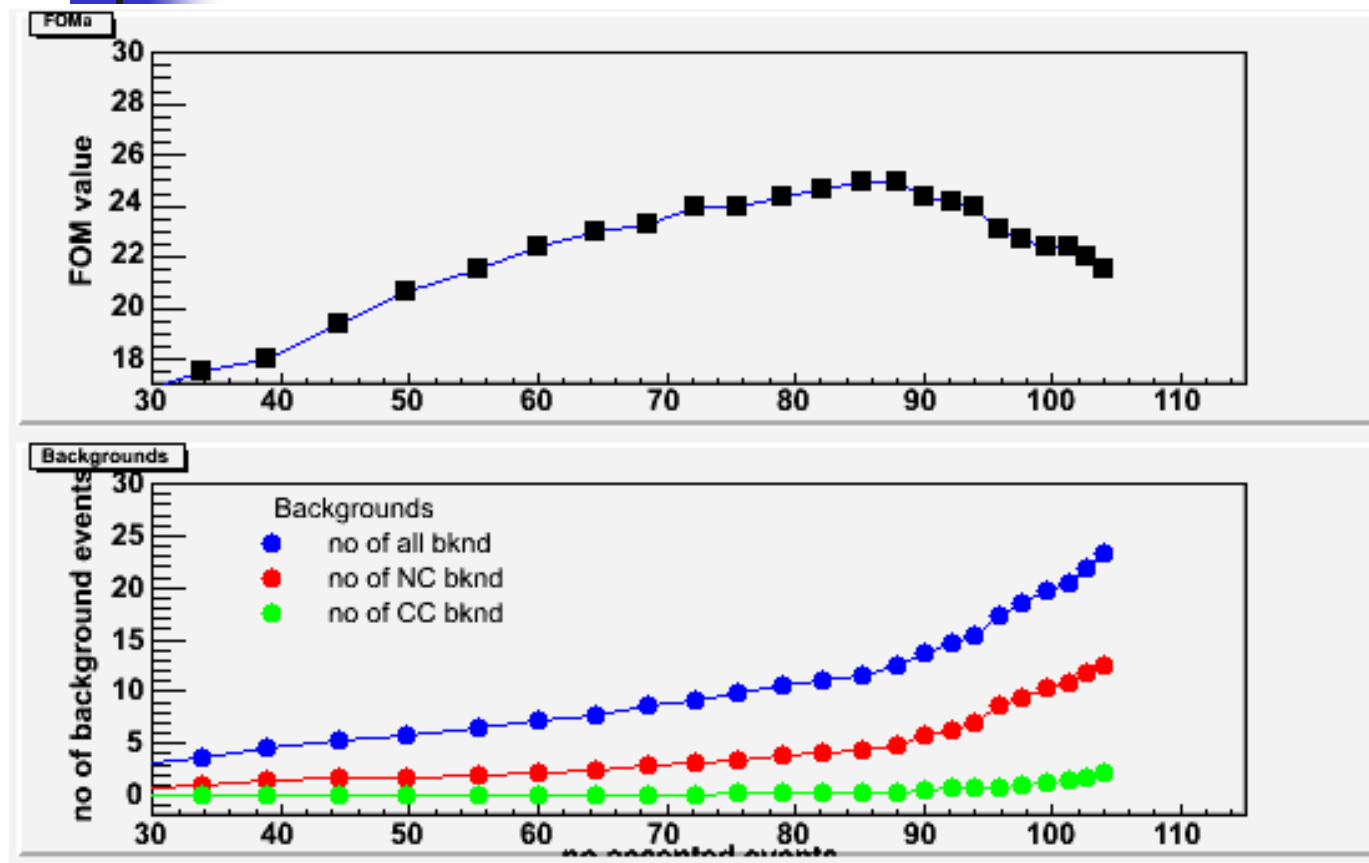
$\nu_e$ - low energy (0 - 6 GeV) - CC	120K
$\nu_\mu$ - low energy - NC	~145K
$\nu_\mu$ - all energies (0 - 20GeV) - NC	120K
$\nu_\mu$ - low energy - CC	120K

## Results

Event selection	FOM training	FOM test/free bin	FOM test/bin forced
All	24.71 +- 0.54		
Odd/even	24.77 +- 0.77	24.99 +- 0.78	24.34 +- 0.77
Even/odd	24.77 +- 0.77	24.30 +- 0.77	23.71 +- 0.77
Average			24.02 +- 0.54



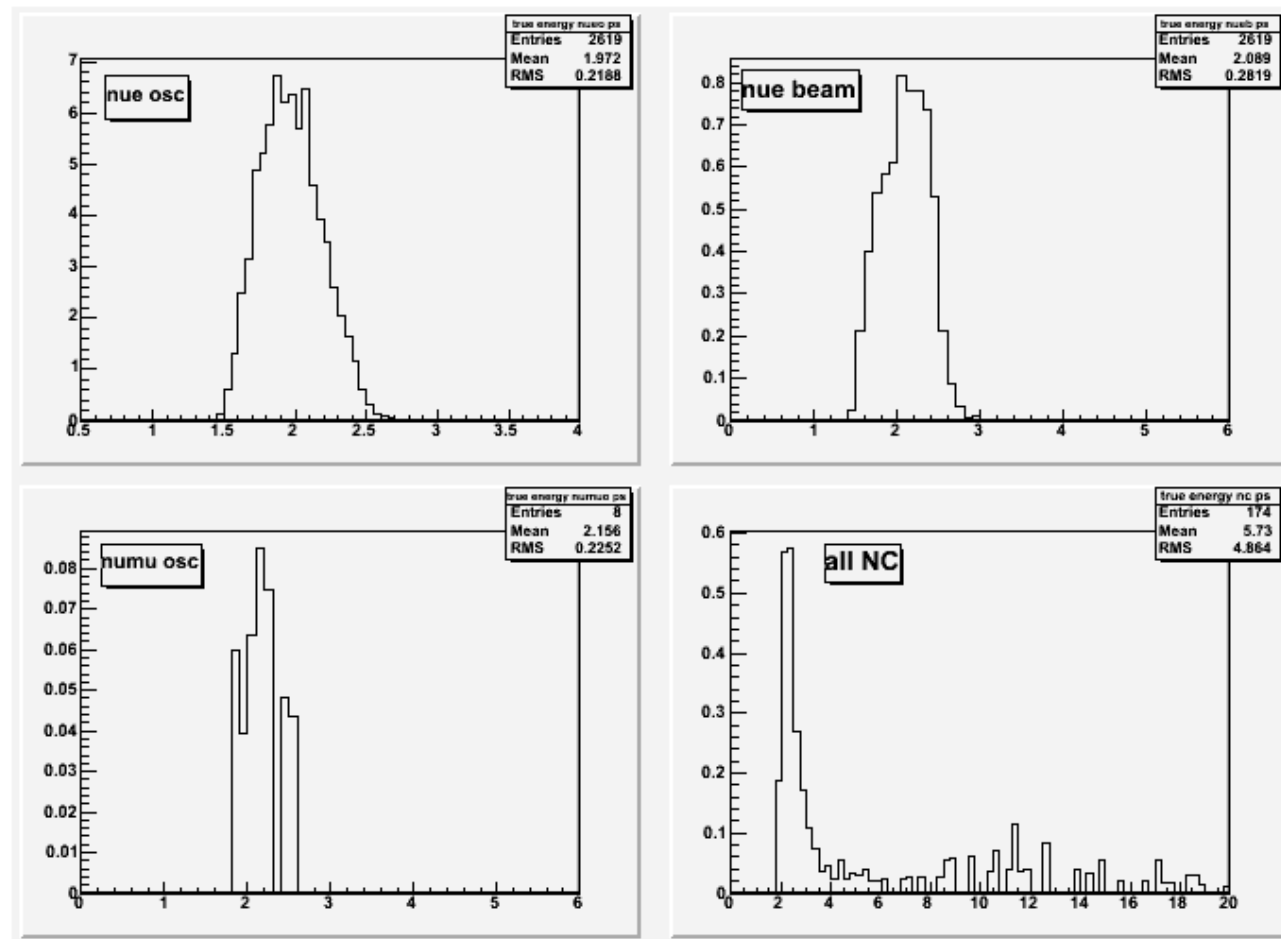
# Sources of background



6.75  $\nu_e$ -beam  
4.08 NC  
0.26  $\nu_\mu$  CC



# True energy of accepted events



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# More Recent Analysis

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- New Geometry (Leon M)
  - Shorter cells (17.5 -> 15.7 m)
  - Thicker wall sizes (by 1 mm)
  - Several different (larger) cell sizes tried
- Minor Changes in Analysis Code
  - Minor bug in fiducial cuts fixed
  - Definition of FOM modified
  - These two changes decrease FOM by about 0.5
- Note: RECO MINOS not reoptimized for new sell dimensions



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# Initial Results

Cell width	Cell depth	FOM	$\sigma_E$
3.8 cm	4.5 cm	22.8	10.0%
3.8 cm	6.0 cm	23.2	10.7%
5.4 cm	4.5 cm	20.6	9.9%



# Light Levels

(using modified UMinn code,  $R_{\text{asympt}} = 0.966$ )

Width	Depth	Fiber diameter	Fiber length	Location	$N_{\text{pe}}\text{-far}$	Rel $N_{\text{pe}}$ per cell	Rel $N_{\text{pe}}$ per dE/dx
3.8	4.5	0.8	2 x (15.7+1.0)	Corners	57.3	1.00	1.00
3.8	4.5	0.8	2 x (15.7+1.0)	Center	66.6	1.16	1.16
3.8	6.0	0.8	2 x (15.7+1.0)	Corners	65.2	1.14	0.85
3.8	8.0	0.8	2 x (15.7+1.0)	Corners	74.1	1.29	0.73
5.4	4.5	0.8	2 x (15.7+1.0)	Corners	50.3	0.88	0.88
3.8	4.5	0.8	2 x (17.5+1.0)	Corners	48.1	0.84	0.84
3.8	4.5	0.8	2 x (15.7+1.0)	Corners	41.6	0.73	0.73

Reflectivity decreased by 3% for all wavelengths

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# Conclusions

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- The current analysis appears to give a FOM value of about 23
- There are a number of possible new approaches which might be able to improve the results
- Larger cell widths do not appear promising but going to deeper cells might be advantageous
- I would like to see following avenues investigated:
  - Improved track identification in RECO MINOS (cell size dependent)
  - Improved analysis of ntuples
  - “Blind” visual analysis of events in the vicinity of likelihood cut
  - Effect of varying light output